Space Weather Technical Forecast

Issued on Friday, 22 October 2021 at 01:13 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: Chance of Active fluence day 4 (25 Oct).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity was Very Low, with only small B-class flares, these most likely from a new region that is currently emerging onto the southeast limb. There is one numbered region on the visible disc: AR2886 (Hsx/Alpha), in the southeast quadrant. This region appears to be stable with a magnetically simple configuration. A new Bxo/beta region has also emerged in the northeast quadrant, but this appears to be be small and weak with no further development. No new Earth-directed CMEs were observed in available imagery in the last 24 hours.

Solar Wind / Geomagnetic Activity: Solar wind speeds, as measured by DSCOVR at L1, have been at predominantly elevated levels, peaking at 561 km/s at 21/0105 UTC. The solar wind density was average. Total IMF, Bt, was Weak and also the north-south component Bz, which was slightly negative for end of the day. The Phi angle was been mainly negative (towards the Sun). Resultant geomagnetic activity was Quiet (Kp 1-2). These parameters suggest a connection to the high speed stream from negative coronal hole CH13/-.

Energetic Particles / Solar Radiation: The high energy proton flux (greater than 10 MeV) as measured by GOES-16 was at background levels, with no solar radiation storms observed. High energy electron flux (greater than 2 MeV) was predominantly at background levels. Associated 24-hour electron fluence was on a fairly steady trend, well below the Active (1e8 integrated pfu) threshold, with 1.26e6 integrated pfu recorded at 21/2100 UTC.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to be at low or very low levels through the next few days, but with perhaps an increase in flare probabilities as the new active region rotates further onto the southeast limb.

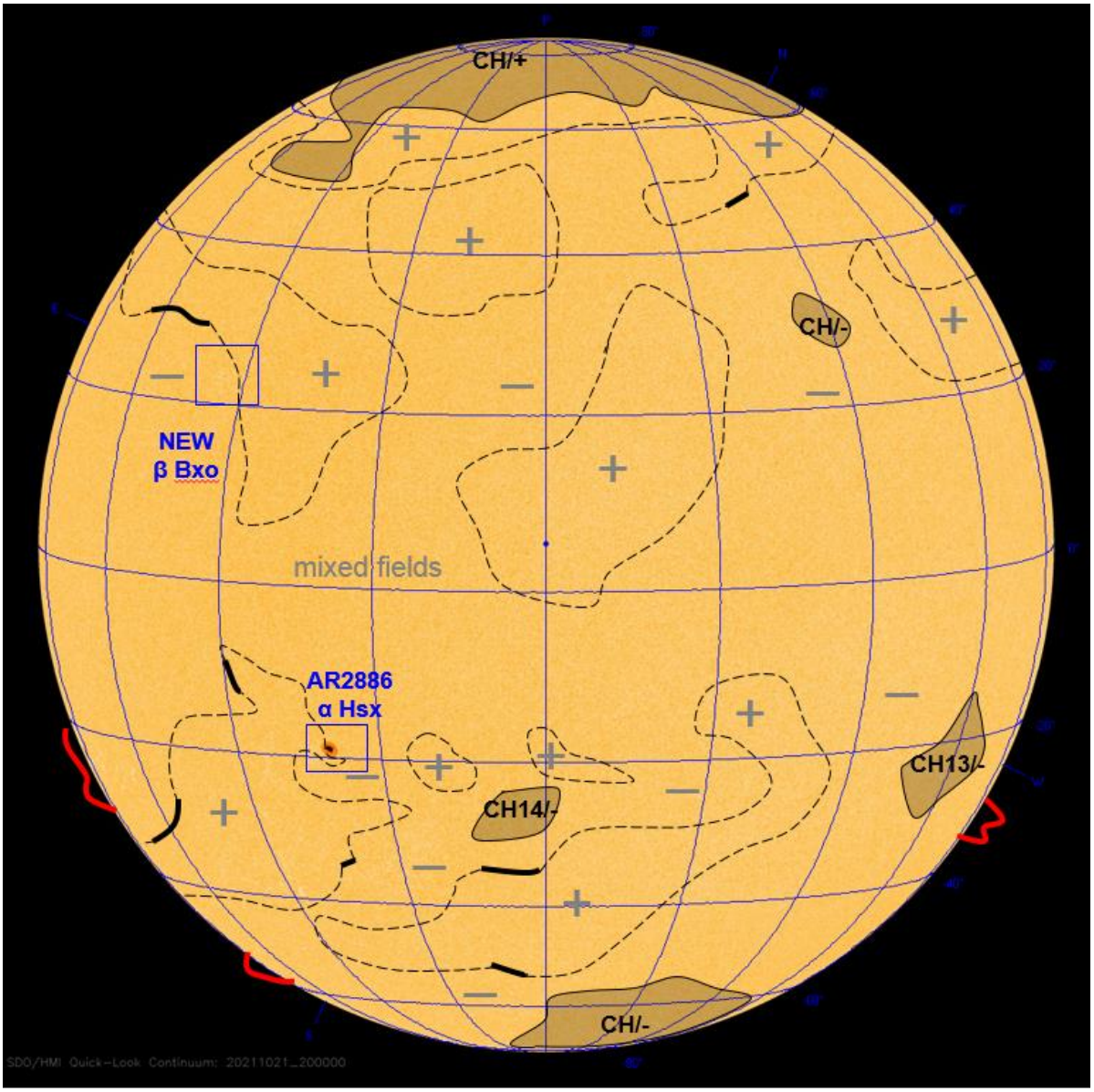
Solar Wind / Geomagnetic Activity: The solar wind is currently elevated due to connection to CH13/-, but the solar wind speed will gradually through today and tomorrow (22-23 Oct) as this HSS influence declines. Geomagnetic activity is expected to be mainly Quiet (Kp 0-2) but with isolated Unsettled (Kp 3) intervals possible.

Energetic Particles / Solar Radiation: The high energy (greater than 10 MeV) proton flux is expected to remain at background levels, with no solar radiation storms expected. The high energy electron flux (greater than 2MeV) is currently at background levels, but may show a rising trend through the next 4 days as the fast wind from CH13/- charges the radiation belts. The 24-hour fluence may also show a rising trend, with a chance of becoming close to the Active (1e8 integrated pfu) threshold by the end of Day 4 (25 Oct).

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2021. All Rights Reserved.

Figure 1. Solar Analysis Valid 21/2000 UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2021. All Rights Reserved.

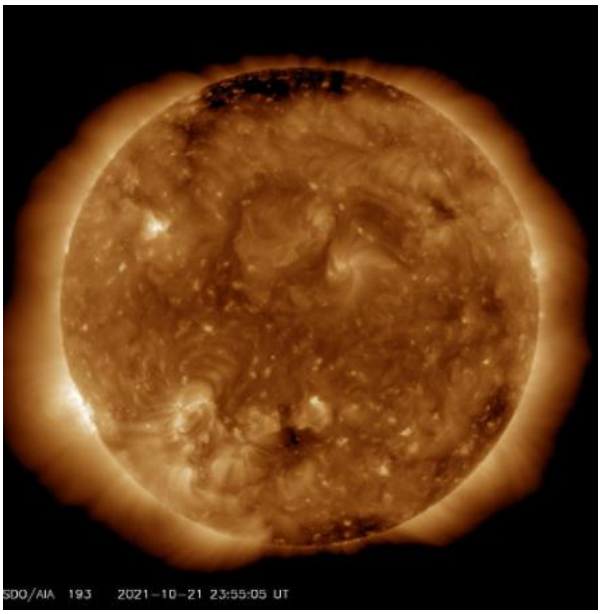
Geomagnetic Storms:

Solar winds are currently elevated around 500 km/s due to coronal hole influences related to CH13/-. The hole is slightly more advanced than on the previous rotation and as such solar winds have likely peaked with a gradual decline through today and tomorrow. As no further significant coronal holes are present in the western hemisphere, the solar wind is expected to reach background levels for days 3 and 4 (24th and 25th).

Geomagnetic activity is expected to be mainly Quiet (Kp 0-2) but with isolated Unsettled (Kp 3) intervals possible.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	1	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Figure 2: Latest SDO AIA/193 showing only small and weak coronal hole features in the western hemisphere, with no imminent significant coronal holes at that could affect the forecast.



Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2021. All Rights Reserved.

Met Office Space Weather Technical Forecast

Radio Blackouts - X-Ray Flares:

Solar activity is expected to be at low or very low levels through the next few days.
There is one numbered active region on the visible disc at present, AR2886 (Hsx/Alpha), located in the southeast quadrant. This region remains in a stable appearing configuration with no notable flares observed during the past 24 hours. A new Bxo/beta region has also emerged in the northeast quadrant, but this appears to be be small and weak with no further development. However, a new region is currently emerging onto the southeast limb, probably responsible for the few small B-Class flares that have been observed over the past 24 hours. As such, the probability of flaring is likely to increase over the next few days, and this is reflected in the probabilities for M-Class flares.

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**R1-R2 M Class**	No	1	5	5	5
Very Active	**R3 to R5 X Class**	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

With no significant flare activity forecast for this period, and only three relatively small and weak active regions currently in the eastern hemisphere, solar radiation storms are not expected.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	1	1	1	1
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

High Energy Electrons Event (≥ 2MeV):

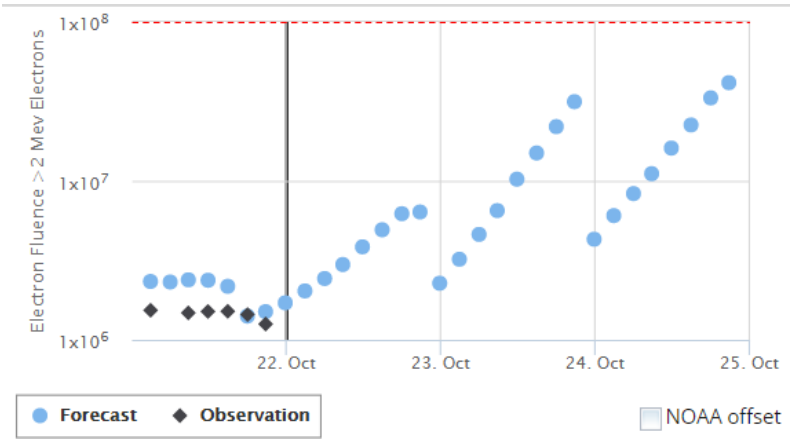
Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2021. All Rights Reserved.

The high energy (greater than 2 MeV) electron flux is currently at background levels. The influence of the current high speed stream, from CH13/-, may drive an increase in flux levels, which may then give a flux increase at GEO later in the period. Flux levels rose on the previous rotation, but not above the High (1000 pfu) level.
The electron fluence is currently well below the Active (1e8 integrated pfu) threshold on a steady trend. However as flux levels are likely to rise through the period so will the corresponding fluence levels. There is a chance of seeing fluence close to Active threshold by the end of Day 4 (25 Oct), with the REFM model currently indicating a rising trend, the model is considered to be good guidance.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	1	5	20	30
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

Figure 3: Latest Met Office REFM model.



Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2021. All Rights Reserved.